

AMENDMENT TO THE CLAIMS

This listing of claims will replace all prior versions of claims in the application.

LISTING OF CLAIMS:

1. (CURRENTLY AMENDED) A magnetic head, comprising:
an antiparallel (AP) pinned layer structure having at least two pinned layers
having magnetic moments that are self-pinned antiparallel to each other;
and
a free layer structure spaced apart from the AP pinned layer structure, the free
layer structure comprising:
a first free layer having a magnetic moment;
a second free layer having a magnetic moment pinned antiparallel to the
magnetic moment of the first free layer; and
a third free layer having a magnetic moment pinned antiparallel to the
magnetic moment of the second free layer,
wherein a net magnetic moment of the second and third free layers is
negligible.
2. (CURRENTLY AMENDED) A head as recited in claim 1, ~~wherein a net~~
~~magnetic moment of the second and third free layers is negligible further~~
comprising a second antiparallel pinned layer structure spaced apart from the AP
pinned layer structure, the second AP pinned layer structure having at least two
pinned layers having magnetic moments that are self-pinned antiparallel to each
other.
3. (ORIGINAL) A head as recited in claim 1, wherein a thickness of each of the
free layers perpendicular to planes of the free layers is less than about 100 Å.

4. (ORIGINAL) A head as recited in claim 1, wherein a thickness of the first free layer is greater than thicknesses of the second and third free layers, individually, the thicknesses being measured in a direction perpendicular to a plane of the first free layer.
5. (ORIGINAL) A head as recited in claim 1, further comprising hard bias layers positioned towards opposite track edges of the free layer structure.
6. (ORIGINAL) A head as recited in claim 1, wherein the second free layer is constructed of a material having a lower electrical conductivity than the first and third free layers.
7. (ORIGINAL) A head as recited in claim 6, wherein second free layer includes at least NiFe, wherein the first and third free layers include at least CoFe.
8. (ORIGINAL) A head as recited in claim 1, further comprising a Cu spacer layer positioned between the AP pinned layer structure and the free layer structure.
9. (ORIGINAL) A head as recited in claim 1, wherein the head forms part of a GMR head.
10. (ORIGINAL) A head as recited in claim 1, wherein the head forms part of a CPP GMR sensor.
11. (CURRENTLY AMENDED) A magnetic head, comprising:
an upper antiparallel (AP) pinned layer structure having at least two pinned layers having magnetic moments that are self-pinned antiparallel to each other; and
a lower antiparallel-pinned layer structure spaced apart from the upper AP pinned layer structure; ~~the lower AP-pinned layer structure having at~~

~~least two pinned layers having magnetic moments that are self-pinned
antiparallel to each other;~~

a free layer structure positioned between the AP pinned layer structures, the free
layer structure comprising:

a first free layer having a magnetic moment;

a second free layer having a magnetic moment pinned antiparallel to the
magnetic moment of the first free layer; and

a third free layer having a magnetic moment pinned antiparallel to the
magnetic moment of the second free layer,

wherein the second free layer is constructed of a material having a lower
electrical conductivity than the first and third free layers.

12. (ORIGINAL) A head as recited in claim 11, wherein a net magnetic moment of the second and third free layers is negligible.
13. (ORIGINAL) A head as recited in claim 11, wherein a thickness of each of the free layers perpendicular to planes of the free layers is less than about 100 Å.
14. (ORIGINAL) A head as recited in claim 11, wherein a thickness of the first free layer is greater than thicknesses of the second and third free layers, individually, the thicknesses being measured in a direction perpendicular to a plane of the first free layer.
15. (ORIGINAL) A head as recited in claim 11, further comprising hard bias layers positioned towards opposite track edges of the free layer structure.
16. (CURRENTLY AMENDED) A head as recited in claim 11, ~~wherein the second free layer is constructed of a material having a lower electrical conductivity than the first and third free layers~~ further comprising a second antiparallel pinned layer structure spaced apart from the AP pinned layer structure, the second AP

pinned layer structure having at least two pinned layers having magnetic moments that are self-pinned antiparallel to each other.

17. (CURRENTLY AMENDED) A head as recited in claim 11, wherein the second free layer includes at least NiFe, wherein the first and third free layers include at least CoFe.
18. (ORIGINAL) A head as recited in claim 11, further comprising Cu spacer layers positioned between the AP pinned layer structures and the free layer structure.
19. (ORIGINAL) A head as recited in claim 11, wherein the head forms part of a GMR head.
20. (ORIGINAL) A head as recited in claim 11, wherein the head forms part of a CPP GMR sensor.
21. (ORIGINAL) A magnetic storage system, comprising:
 - magnetic media;
 - at least one head for reading from and writing to the magnetic media, each head having:
 - a sensor having the structure recited in claim 1;
 - a write element coupled to the sensor;
 - a slider for supporting the head; and
 - a control unit coupled to the head for controlling operation of the head.
22. (ORIGINAL) A magnetic storage system, comprising:
 - magnetic media;
 - at least one head for reading from and writing to the magnetic media, each head having:
 - a sensor having the structure recited in claim 11;

a write element coupled to the sensor;
a slider for supporting the head, and
a control unit coupled to the head for controlling operation of the head.

23. (NEW) A magnetic head, comprising:
- an antiparallel (AP) pinned layer structure having at least two pinned layers having magnetic moments that are self-pinned antiparallel to each other;
and
 - a free layer structure spaced apart from the AP pinned layer structure, the free layer structure comprising:
 - a first free layer having a magnetic moment;
 - a second free layer having a magnetic moment pinned antiparallel to the magnetic moment of the first free layer; and
 - a third free layer having a magnetic moment pinned antiparallel to the magnetic moment of the second free layer,
- wherein a thickness of the first free layer is greater than thicknesses of the second and third free layers, individually, the thicknesses being measured in a direction perpendicular to a plane of the first free layer.